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(71) Applicant:
MURATA MANUFACTURING CO., LTD.
Nagaokakyo-shi Kyoto-fu (JP)

(72) Inventor: **Arakawa, Shigeji**
Nagaokakyo-shi, Kyoto-fu (JP)

(74) Representative:
Schoppe, Fritz, Dipl.-Ing. et al
Schoppe & Zimmermann
Patentanwälte
Postfach 71 08 67
81458 München (DE)

(54) Dielectric filter and dielectric duplexer

(57) A dielectric filter (11) includes a couple of transverse electric (TE)10-mode resonators (1a, 1b) connected in series. Each resonator (1a, 1b) is such that a conductor (3a, 3b) is formed on one substantially entire surface of a dielectric body (6a, 6b). On the connection surfaces of the resonators (1a, 1b) are formed grooves (2a, 2b), respectively. On the inner round surface of the grooves (2a, 2b), excluding the portions of central gaps (21a, 21b), there are formed conductors (3a, 3b). Connecting the couple of resonators (1a, 1b) combines the grooves (2a, 2b) to form a coupling-adjustment hole (2) having an axis parallel to the interface between the resonators (1a, 1b). The gaps (21a, 21b) combine to form a coupling window (21). The coupling window (21) is exposed in the coupling-adjustment hole (2), which electromagnetically couples the couple of resonators (1a, 1b).

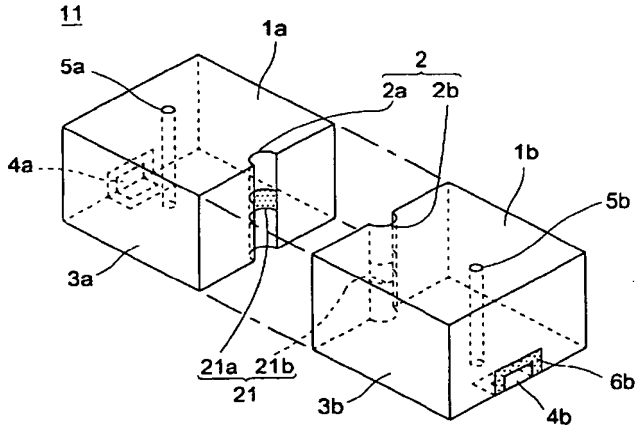

FIG.1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to dielectric filters and dielectric duplexers, and in particular, to a dielectric filter and a dielectric duplexer used in a microwave or millimeter-wave-band communication apparatus or the like.

2. Description of the Related Art

As shown in Fig. 14, there is a known conventional dielectric filter 30 formed by connecting in series transverse electric (TE)10-mode dielectric resonators 31a and 31b in which conductors 33a and 33b are formed on substantially entire surfaces of rectangular parallelepiped dielectric bodies 36a and 36b. On the connection surfaces of the resonators 31a and 31b, excluding the portions of rectangular coupling windows 32a and 32b, the conductors 33a and 33b are respectively formed. Connecting the resonators 31a and 31b causes the coupling windows 32a and 32b to correspond to each other, and the resonators 31a and 31b are inductively or capacitively coupled via the coupling windows 32a and 32b. In this arrangement, the connection surfaces of the resonators 31a and 31b have no portions exposed from surfaces of the dielectric filter 30.

At ends of the resonators 31a and 31b are formed input/output electrodes 34a and 34b so as not be conductive to the conductors 33a and 33b. The resonators 31a and 31b are also provided with external coupling holes 35a and 35b.

The central frequency of the dielectric filter 30 is determined by dimensions in the length direction (x direction denoted by an arrow in Fig. 12) and the width direction (y direction denoted by an arrow in Fig. 12) of the resonators 31a and 31b. In addition, characteristics (the electromagnetic coupling amount, pass-band width, etc. between the resonators 31a and 31b) of the dielectric filter 30 are determined by the sizes of the coupling windows 32a and 32b and so forth.

In general, when characteristic of a dielectric filter are adjusted, characteristics such as a pass-band width are measured, with a plurality of resonators connected to one another, and the adjustment is performed by changing the sizes of the coupling windows 32a and 32b and so forth in accordance with the measured results. However, according to the conventional dielectric filter 30, when the resonators 31a and 31b are connected to each other, the coupling windows 32a and 32b cannot be exposed from surfaces of the dielectric filter 30. Accordingly, by disengaging the connection between the resonators 31a and 31b so that they are separate, the connection surfaces of the resonators 31a and 31b on which the coupling windows 32a and 32b are formed must be exposed. In addition, after performing adjustment by using a cutting tool like a router to cut the conductors 33a and 33b peripheral to the coupling windows 32a and 32b so that the sizes of the coupling windows 32a and 32b and so forth are changed, the resonators 31a and 31b must be connected for restoration. Accordingly, the adjustment operation is complicated, and after changing the sizes of the coupling windows 32a and 32b and so forth, the connection between the resonators 31a and 31b can hardly be restored with preferable reproducibility, which causes a problem in the stability of the characteristic adjustment.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a dielectric filter and a dielectric duplexer whose characteristics can be adjusted, with resonators mutually connected.

To this end, according to the present invention, the foregoing object has been achieved through provision of a dielectric filter and a dielectric duplexer including a plurality of TE-mode resonators connected in series, the TE-mode resonators including dielectric bodies and conductors formed on surfaces of the dielectric bodies, in which a groove is formed on the connection surface of at least either of an adjacent couple among the TE-mode resonators, and the groove-formed surface and the connection surface of the other TE-mode resonator are joined to form a coupling-adjustment hole having a coupling window formed on the inner round surface thereof and an axis parallel to the interface between the joined TE-mode resonators, the coupling window including the formed groove and the corresponding portion of the other TE-mode resonator.

According to the present invention, a coupling window is exposed from the inner round surface of a coupling-adjustment hole formed in a dielectric filter or a dielectric duplexer, even though a couple of resonators are not separate. Accordingly, by inserting a cutting tool like a router into the coupling-adjustment hole, and cutting a conductor peripheral to the coupling window so that the size of the coupling window and so forth are changed, characteristics of the dielectric filter can be adjusted, with the couple of resonators mutually connected.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded perspective view showing a dielectric filter according to a first embodiment of the present invention.

Fig. 2 is a perspective exterior view showing the dielectric filter shown in Fig. 1.

Fig. 3 is an enlarged sectional view showing the dielectric filter shown in Fig. 2.

Fig. 4 is an exploded perspective view showing a dielectric filter according to a second embodiment of the present invention.

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Fig. 5 is an exploded perspective view showing a dielectric filter according to a third embodiment of the present invention.

Fig. 6 is an exploded perspective view showing a dielectric filter according to a fourth embodiment of the present invention.

Fig. 7 is an exploded perspective view showing a dielectric filter according to a fifth embodiment of the present invention.

Fig. 8 is an exploded perspective view showing a dielectric filter according to a sixth embodiment of the present invention.

Fig. 9 is an exploded perspective view showing a dielectric duplexer according to an embodiment of the present invention.

Fig. 10 is a perspective exterior view showing a dielectric duplexer of Fig. 9.

Fig. 11 is a perspective exterior view showing a dielectric filter according to another embodiment of the present invention.

Fig. 12 is a perspective exterior view showing a dielectric filter according to a further embodiment of the present invention.

Fig. 13 is an exploded perspective view showing a dielectric filter according to a still further embodiment of the present invention.

Fig. 14 is an exploded perspective view showing a conventional dielectric filter.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Dielectric filters according to the following embodiments of the present invention will be described below with reference to the attached drawings. In the embodiments, identical components and portions are denoted by identical reference numerals.

[First Embodiment: Figs. 1 to 3]

As shown in Fig. 1, a dielectric filter 11 is formed by connecting in series TE10-mode dielectric resonators 1a and 1b in which substantially entire surfaces of dielectric bodies 6a and 6b are provided with conductors 3a and 3b. On the connection surfaces of the resonators 1a and 1b, which are cross-sectionally rectangular, cross-sectionally semicircular grooves 2a and 2b are formed from top to bottom of the resonators 1a and 1b. On the inner round surfaces of the grooves 2a and 2b, excluding the portions of central gaps 21a and 21b, the conductors 3a and 3b are formed. At ends of the resonators 1a and 1b are formed input/output electrodes 4a and 4b so as not to be conductive to the conductors 3a and 3b, with predetermined distances provided thereto. The resonators 1a and 1b are also provided with external coupling holes 5a and 5b, respectively. However, the external coupling holes 5a and 5b are not always necessary.

By joining the connection surfaces of the resonators 1a and 1b having the above structure, the dielectric filter 11 can be formed. As shown in Fig. 2, the grooves 2a and 2b of the resonators 1a and 1b combine to form a cross-sectionally circular coupling-adjustment hole 2 having an axis parallel to the interface. This coupling-adjustment hole 2 vertically penetrates the dielectric filter 11. The gaps 21a and 21b, formed on the inner round surfaces of the grooves 2a and 2b, combine to form an annular coupling window 21.

In the above-described dielectric filter 11, the resonators 1a and 1b are inductively or capacitively coupled by the coupling window 21. Characteristics (the electromagnetic coupling amount, pass-band width, etc. between the resonators 1a and 1b) of the dielectric filter 11 are determined by the size of the coupling window 21, and so forth. The coupling window 21 is exposed from the inner round surface of the coupling-adjustment hole 2, with the resonators 1a and 1b mutually connected.

The operation and advantages of the dielectric filter 11 will be described below with reference to a technique for adjusting characteristics such as a pass-band width.

At first, characteristics of the dielectric filter 11, such as the pass-band width, are measured. Next, the size of the coupling window 21, and so forth, are changed based on the measured results. At this time, the coupling window 21 is exposed from the inner round surface of the coupling-adjustment hole 2, with the resonators 1a and 1b not being separate. Thus, as shown in Fig. 3, by inserting a cutting tool 8 like a router into the coupling-adjustment hole 2, and cutting the conductors 3a and 3b peripheral to the coupling window 21, the size of the coupling window 21 and so forth can be changed. Accordingly, the characteristics of the dielectric filter 11 can be adjusted, with the resonators 1a and 1b mutually connected, which facilitates the adjustment operation. In addition, it is not necessary to disengage or restore the connection between the resonators 1a and 1b. This manner eliminates instability, in the adjustment of the conventional dielectric filter, caused by the difficulty of restoring the connection between the resonators 1a and 1b with preferable reproducibility.

[Second, Third, Fourth and Fifth Embodiments: Figs. 4 to 7]

As shown in Figs. 4 to 7, dielectric filters 12, 13, 14 and 15 according to second, third, fourth and fifth embodiments of the present invention have structures, identical to the structure of the dielectric filter 11 according to the first embodiment of the present invention, excluding grooves formed on the connection surfaces of resonators 1a and 1b in the second to fifth embodiments. On the connection surfaces of resonators 1a and 1b of the dielectric filters 12, 13, 14 and 15, grooves 2c to 2j are formed.

On the inner round surfaces of the grooves 2c to 2j,

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excluding the portions of central gaps 21a and 21b, conductors 3a and 3b are formed. Connecting the connection surfaces of the resonators 1a and 1b combines the grooves 2c and 2d, the grooves 2e and 2f, the grooves 2g and 2h, and the grooves 2i and 2j, which forms coupling adjustment holes 2 having axes parallel to the interfaces. And, the gaps 21a and 21b, formed on the inner round surfaces of the grooves 2c to 2j, combine to form each coupling window 21.

As shown in Fig. 4, the grooves 2c and 2d of the dielectric filter 12 according to the second embodiment are formed from the front side to the inner side. Accordingly, the coupling-adjustment hole 2 horizontally penetrates the dielectric filter 12. As shown in Fig. 5, the grooves 2e and 2f of the dielectric filter 13 according to the third embodiment are formed such that grooves formed from top to bottom of the resonators 1a and 1b, and grooves formed from the front side to the inner side thereof, are combined to cross mutually. Accordingly, the coupling-adjustment hole 2 horizontally, vertically penetrates the dielectric filter 13. As shown in Fig. 6, the grooves 2g and 2h of the dielectric filter 14 according to the fourth embodiment are formed from top to bottom of the resonators 1a and 1b so as to incline. Accordingly, the coupling-adjustment hole 2 penetrates the dielectric filter 14 so as to incline with respect to the vertical direction. As shown in Fig. 7, the grooves 2i and 2j of the dielectric filter 15 according to the fifth embodiment combine to form the coupling-adjustment hole 2.

The operations and advantages of the dielectric filters 12 to» 15, according to the second to fifth embodiments, operate similar to the dielectric filter 11 according to the first embodiment. In addition, according to each embodiment, by changing the shape of the coupling-adjustment hole 2, a degree of freedom in dielectric-filter design can be enhanced.

[Sixth Embodiment: Fig. 8]

As shown in Fig. 8, a dielectric filter 16 according to a sixth embodiment of the present invention has a structure similar to that of the dielectric filter 11 according to the first embodiment, excluding that a groove 2a is formed on only the connection surface of one resonator 1a and the connection surface of the other resonator 1b is not provided with a groove so as to be plane.

On the inner round surface of the groove 2a formed on the connection surface of the resonator 1a, excluding the portion of a central gap 21a, there is formed a conductor 3a. Also, on the connection surface of the resonator 1b, excluding the portion of a plane rectangular gap 21c opposed to the gap 21, there is formed a conductor 3b. Joining the connection surfaces of the resonators 1a and 1b forms a coupling-adjustment hole 2 having an axis parallel to the interface, which is composed of the groove 2a and the corresponding connection-surface portion of the resonator 1b. The coupling-adjustment hole 2 is cross-sectionally semicircular. The gaps 21a and 21c combine to form a coupling window 21.

The operations and advantages of the dielectric filters 16, according to the sixth embodiment, operates similar to the dielectric filter 11 according to the first embodiment. In addition, according to the sixth embodiment, a degree of freedom in dielectric-filter design can be enhanced.

[Seventh Embodiment: Figs. 9 and 10]

A description will now be given of a dielectric duplexer used in mobile communication units, such as automobile telephones and mobile cellular telephones, according to a seventh embodiment of the present invention. A dielectric duplexer 61 is configured, as shown in Fig. 9, in such a manner that TE10 mode dielectric resonators 41a, 41b, 41c and 41d formed by providing conductors 53a, 53b, 53c and 53d substantially on the overall surfaces of dielectric members 46a, 46b, 46c and 46d, respectively, are connected in series to each other. Grooves 42a and 42b having a semi-circular shape in cross section are respectively formed on the connecting surfaces of the resonators 41a and 41b in a direction from the upper surface to the lower surface of the resonators 41a and 41b. Similarly, grooves 43a and 43b having a semi-circular shape in cross section are respectively formed on the connecting surfaces of the resonators 41c and 41d in a direction from the upper surface to the lower surface of the resonators 41c and 41d. The conductors 53a, 53b, 53c and 53d are respectively extended on the inner peripheral surfaces of the grooves 42a, 42b, 42c and 42d, except for gaps 51a, 51b, 52a and 52b provided at the center of the grooves 42a, 42b, 43a and 43b, respectively.

A transmitting electrode Tx, an antenna electrode ANTa, an antenna electrode ANTb, and a receiving electrode Rx, which serve as input/output electrodes, are respectively formed on the surfaces of the resonators 41a, 41b, 41c and 41d while ensuring spacings from the conductors 53a, 53b, 53c and 53d so as not to conduct to each other, respectively.

Further, external coupling holes 45a and 45b are formed from the upper surfaces to the lower surfaces of the resonators 41a and 41d, respectively. Likewise, external coupling holes 48a and 48b are formed from the upper surfaces to the lower surfaces of the resonators 41b and 41c, respectively. Leading through-holes 49a and 49b orthogonal to the external coupling holes 48a and 48b, respectively, are further provided. The conductors 53b and 53c are extended on the inner peripheral surfaces of the external coupling holes 48a and 48b and the leading through-holes 49a and 49b, respectively. The conductors 53b and 53c extended on the inner peripheral surfaces of the external coupling holes 48a and 48b are partially trimmed to adjust the impedance. The leading through-holes 49a and 49b are each electrically connected at one end to the antenna

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electrodes ANTa and ANTb, respectively. Accordingly, the external coupling holes 48a and 48b are electrically connected to the antenna electrodes ANTa and ANTb via the leading through-holes 49a and 49b, respectively.

The connecting surfaces of the respective resonators 41a through 41d constructed as described above are coupled to form a dielectric duplexer 61. At this time, the grooves 42a and 42b of the respective resonators 41a and 41b are combined, as shown in Fig. 10, to form a coupling adjustment hole 42 having a circular shape in cross section and having an axis parallel to the connecting surfaces of the resonators 41a and 41b. The gaps 51a and 51b provided on the inner peripheral surfaces of the grooves 42a and 42b, respectively, form a ring-like coupling window 51. Similarly, the grooves 43a and 43b of the respective resonators 41c and 41d form a coupling adjustment hole 43 having a circular shape in cross section and having an axis parallel to the connecting surfaces of the resonators 41c and 41d. The gaps 52a and 52b provided on the inner peripheral surfaces of the grooves 43a and 43b, respectively, form a ring-like coupling window 52. Moreover, the antenna electrode ANTa and the antenna electrode ANTb of the respective resonators 41b and 41c are combined to form an antenna electrode ANT.

In the dielectric duplexer 61 configured as described above, the resonators 41a and 41b are inductively or capacitively coupled through the coupling window 51, thereby forming a transmitting filter (band-pass filter) 60A. The resonators 41c and 41d are inductively or capacitively coupled through the coupling window 52 to form a receiving filter (band-pass filter) 60B. The characteristics (such as the electromagnetic coupling amount between the resonators 41a and 41b or the resonators 41c and 41d and the pass bandwidth) of the dielectric duplexer 61 are determined by the size of the coupling window 51 or 52. The coupling windows 51 and 52 are exposed on the inner peripheral surfaces of the coupling adjustment holes 42 and 43, respectively, in a state in which the resonators 41a and 41b and the resonators 41c and 41d are interconnected.

In the dielectric duplexer 61, a transmitting signal sent from a transmitting circuit system (not shown) to the transmitting electrode Tx is output from the antenna electrode ANT via the transmitting filter 60A, and a receiving signal input into the antenna electrode ANT is output to a receiving circuit system (not shown) from the receiving electrode Rx via the receiving filter 60B.

The operation and advantages of the dielectric duplexer 61 will now be described with reference to an adjusting method for the characteristics, such as the pass bandwidth, as an example.

The characteristics, such as the pass bandwidth, are measured in a state in which the resonators 41a through 41d are connected. Based on the measurements, the sizes of the coupling windows 51 and 52 are changed, for example, in the following manner. The coupling windows 51 and 52 are exposed on the inner peripheral surfaces of the coupling adjustment holes 42 and 43, respectively, without requiring to disconnect the resonators 41a and 41b and the resonators 41c and 41d. It is thus possible to insert a cutting instrument, such as a router, into the holes 42 and 43 from the openings of the coupling adjustment holes 42 and 43, respectively, and to trim the conductors 53a and 53b and the conductors 53c and 53d formed around the coupling windows 51 and 52, respectively.

Thus, adjustments can be made to the characteristics of the dielectric duplexer 61 while the resonators 41a through 41d are connected to each other, thereby making the adjusting operation easier. Moreover, it is unnecessary to disconnect and re-connect the resonators 41a through 41d, which would otherwise cause the problem of the unstable adjustment of a known dielectric duplexer owing to a poor reproducibility of re-connecting the resonators 41a through 41d.

[Another Embodiment]

A dielectric filter and a dielectric duplexer according to the present invention is not limited to the foregoing embodiments, but may be variously modified within the gist of the present invention.

As shown in Fig. 11, at ends of a dielectric filter 17, input/output electrodes are not formed. Instead, by inserting conductive pins 25a and 25b into external coupling holes 5a and 5b, the dielectric filter 17 may be coupled to an external circuit by the conductive pins 25a and 25b. In this case, the external coupling holes 5a and 5b have gaps with respect to the conductors 3a and 3b so as not to be conductive thereto.

In addition, according to the first through sixth embodiments, the dielectric filters 11 to 17 including two resonators 1a and 1b have been described. However, as shown in Fig. 12, by connecting in series three resonators 1a, 1b and 1c or more, a dielectric filter 18 may be formed. In this case, at both sides of the resonator 1c, which is centrally disposed, there is formed a coupling-adjustment hole 2.

As shown in Fig. 13, in addition to grooves 2a, 2b, coupling-window forming gaps 21a and 21b, additional rectangular coupling windows 71a, 71b, 72a and 72b may be formed. Connecting the resonators 1a and 1b causes the coupling windows 71a and 71b to correspond mutually, and causes the coupling windows 72a and 72b to correspond mutually. Accordingly, the resonators 1a and 1b are electromagnetically coupled to the coupling window 21 composed of the gaps 21a and 21b by the coupling windows 71a to 72b.

In addition, after forming conductors, input/output electrodes and gaps on surfaces of resonators, the resonators may be mutually combined, or after forming conductors and gaps on the connection surfaces of resonators, the resonators may be mutually connected before forming conductors and input/output electrodes on other surfaces of the resonators. Also, after forming

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conductors on the entire internal round surfaces of grooves, and combining the resonators to form a coupling-adjustment hole, a coupling window may be formed on the inner round surface of the coupling-adjustment hole by inserting a cutting tool like a router into the coupling-adjustment hole. The cross-sectional shape of each groove is arbitrary. And, according to the foregoing embodiments, one coupling-adjustment hole is formed for one connection surface, but the number of coupling adjustment holes is not always limited to one, but a plurality of coupling adjustment holes may be formed on one connection surface.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled man in the art that the forgoing and other changes in form and details may be made therein without departing from the spirit of the invention.

Claims

1. A dielectric filter (11;12;13;14;15;17;18), comprising:

   a plurality of transverse electric (TE)-mode resonators (1a, 1b; 1a, 1b, 1c) connected in series, said TE-mode resonators (1a,1b; 1a, 1b, 1c) including dielectric bodies (6a, 6b)and conductors (3a, 3b; 3a, 3b, 3c) provided on surfaces of said dielectric bodies (6a, 6b),

   a groove (2a, 2b; 2c, 2d; 2e, 2f, 2g, 2h; 2i, 2j) provided on the connection surface of at least either of an adjacent couple among said TE-mode resonators (1a, 1b; 1a, 1b, 1c), and

   the groove-formed surface and the connection surface of the other TE-mode resonator (1a, 1b; 1a, 1b, 1c) being joined to provide a coupling-adjustment hole (2) having a coupling window (21) provided on the inner round surface thereof and an axis parallel to the interface between the joined TE-mode resonators (1a, 1b; 1a, 1b, 1c), said coupling window (21) including the groove (2a, 2b; 2c, 2d; 2e, 2f, 2g, 2h; 2i, 2j) and the corresponding portion of the other TE-mode resonator (1a, 1b; 1a, 1b, 1c).

2. A dielectric duplexer (61), comprising:

   a plurality of transverse electric (TE)-mode resonators (41a, 41b, 41c, 41d) connected in series, said TE-mode resonators (41a, 41b, 41c, 41d) including dielectric bodies (46a, 46b, 46c, 46d) and conductors (53a, 53b, 53c, 53d) provided on surfaces of said dielectric bodies (46a, 46b, 46c, 46d),

   a groove (42a, 42b, 43a, 43b) provided on the connection surface of at least either of an adjacent couple among said TE-mode resonators (41a, 41b, 41c, 41d), and the groove-formed surface and the connection surface of the other TE-mode resonator (41a, 41b, 41c, 41d) being joined to provide a coupling-adjustment hole (42) having a coupling window (52) provided on the inner round surface thereof and an axis parallel to the interface between the joined TE-mode resonators (41a, 41b, 41c, 41d), said coupling window (52) including the groove (42a, 42b, 42c, 42d) and the corresponding portion of the other TE-mode resonator (41a, 41b, 41c, 41d).

3. A dielectric filter (11; 12; 13; 14; 15; 17; 18) for use as a duplexer (61), comprising:

   a plurality of transverse electric (TE)-mode resonators (1a, 1b; 1a, 1b, 1c) connected in series, said TE-mode resonators (1a, 1b; 1a, 1b, 1c) including dielectric bodies (6a, 6b) and conductors (3a, 3b; 3a, 3b, 3c) provided on surfaces of said dielectric bodies (6a, 6b),

   a groove (2a, 2b; 2c, 2d; 2e, 2f, 2g, 2h; 2i, 2j) provided on the connection surface of at least either of an adjacent couple among said TE-mode resonators (1a, 1b; 1a, 1b, 1c), and

   the groove-formed surface and the connection surface of the other TE-mode resonator (1a, 1b; 1a, 1b, 1c) being joined to provide a coupling-adjustment hole (2) having a coupling window (21) provided on the inner round surface thereof and an axis parallel to the interface between the joined TE-mode resonators (1a, 1b; 1a, 1b, 1c), said coupling window (21) including the groove (2a, 2b; 2c, 2d; 2e, 2f, 2g, 2h; 2i, 2j) and the corresponding portion of the other TE-mode resonator (1a, 1b; 1a, 1b, 1c).

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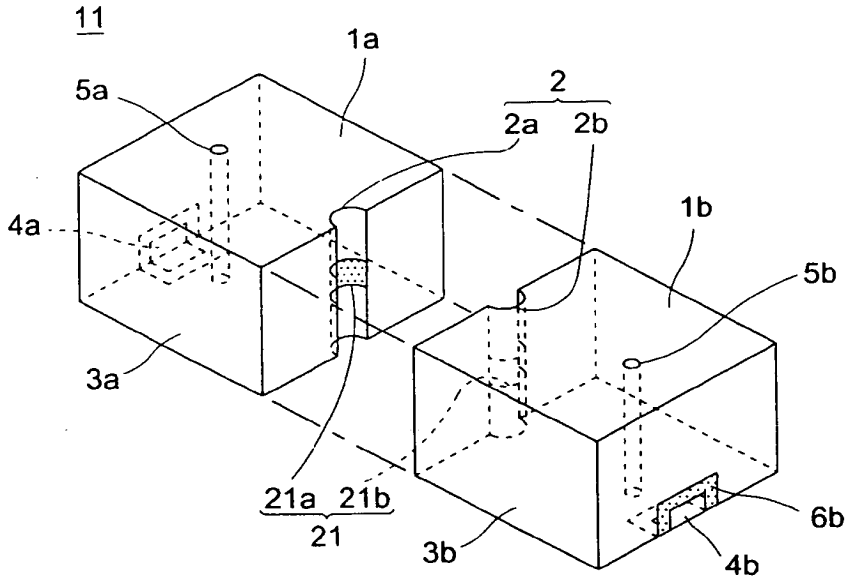

FIG.1

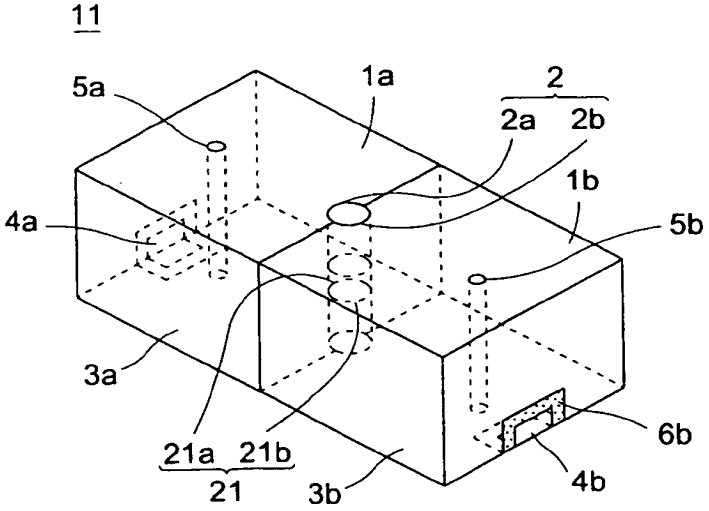

FIG.2

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FIG.3

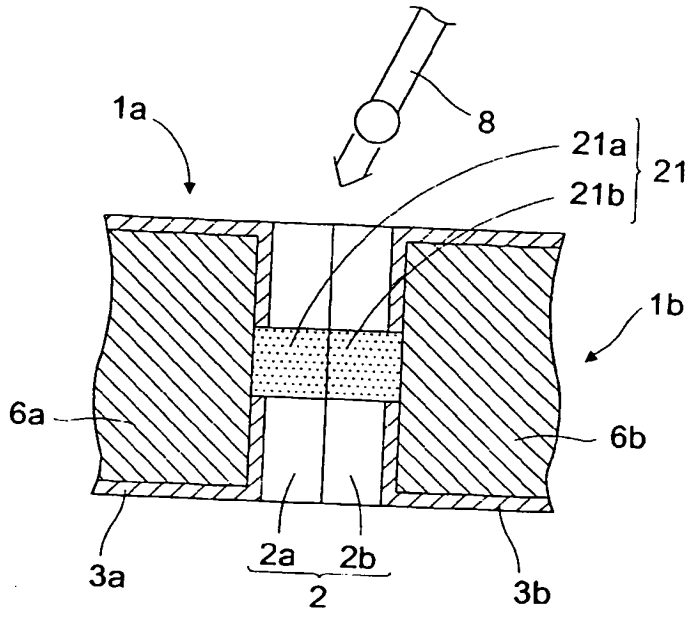
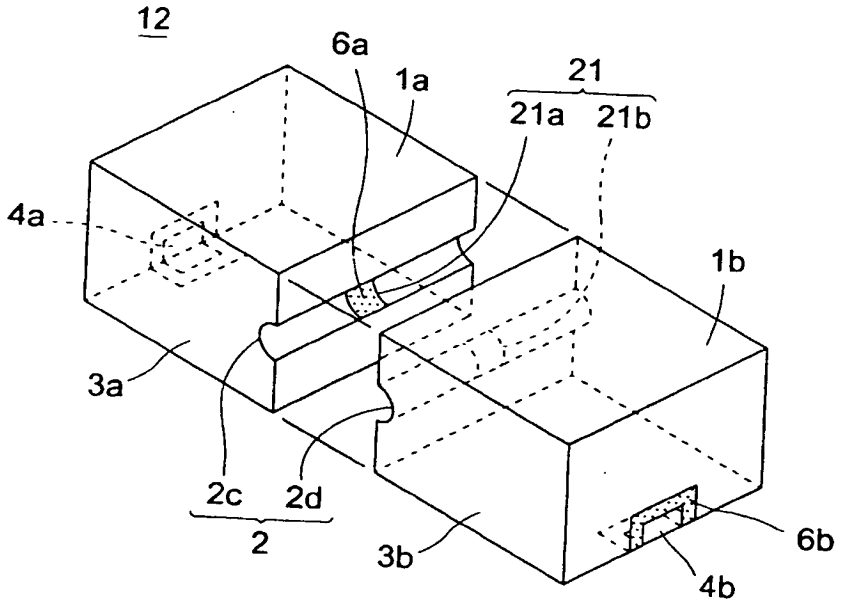


FIG.4



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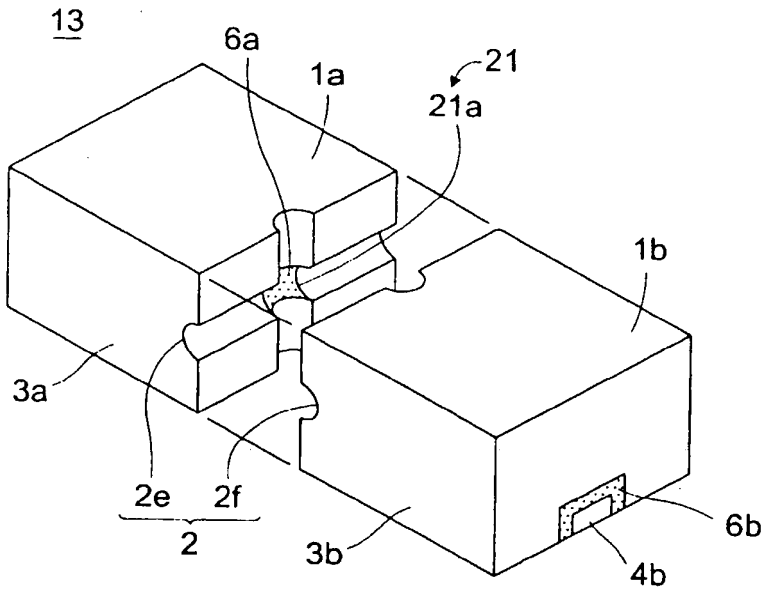

FIG.5

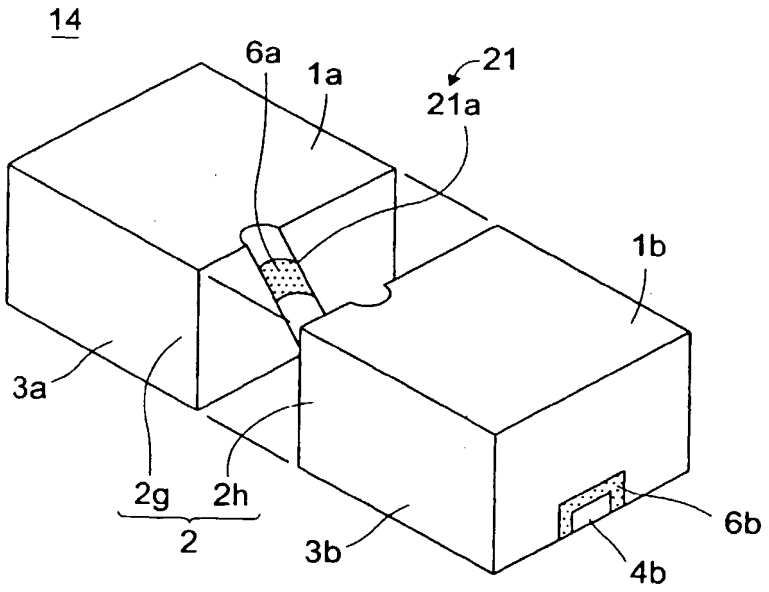

FIG.6

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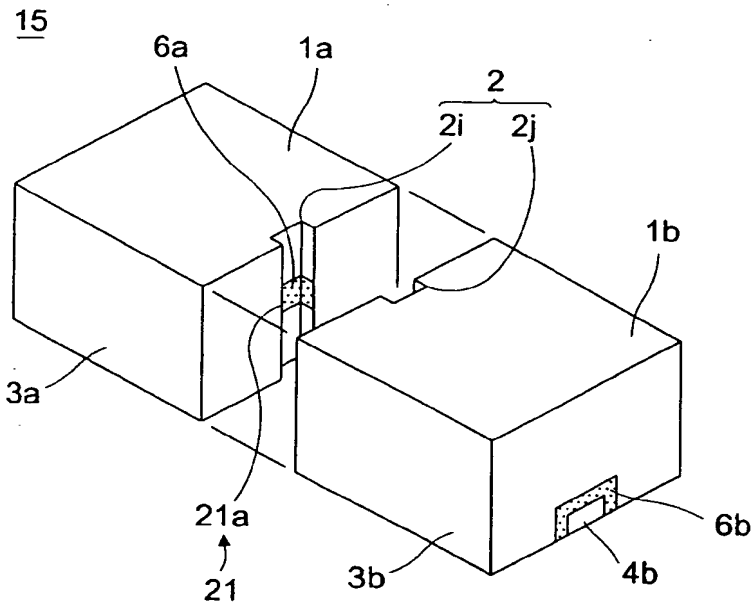

FIG.7

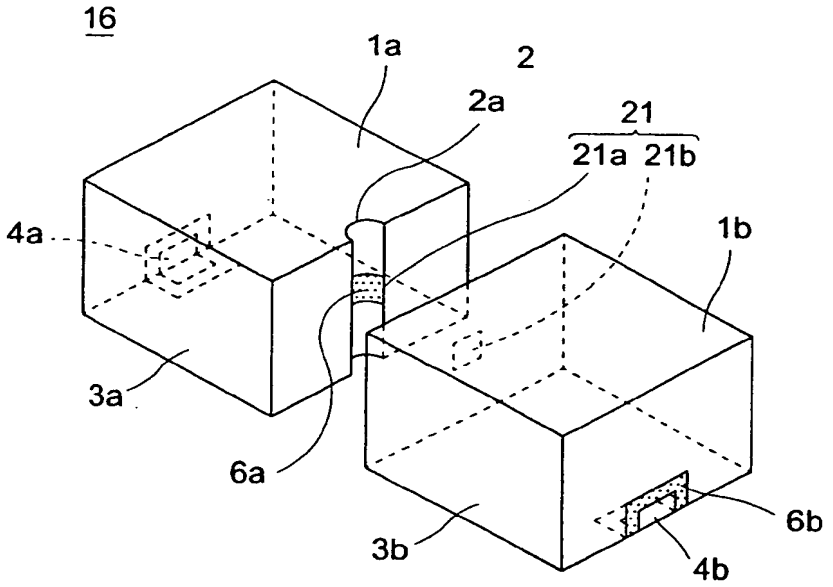

FIG.8

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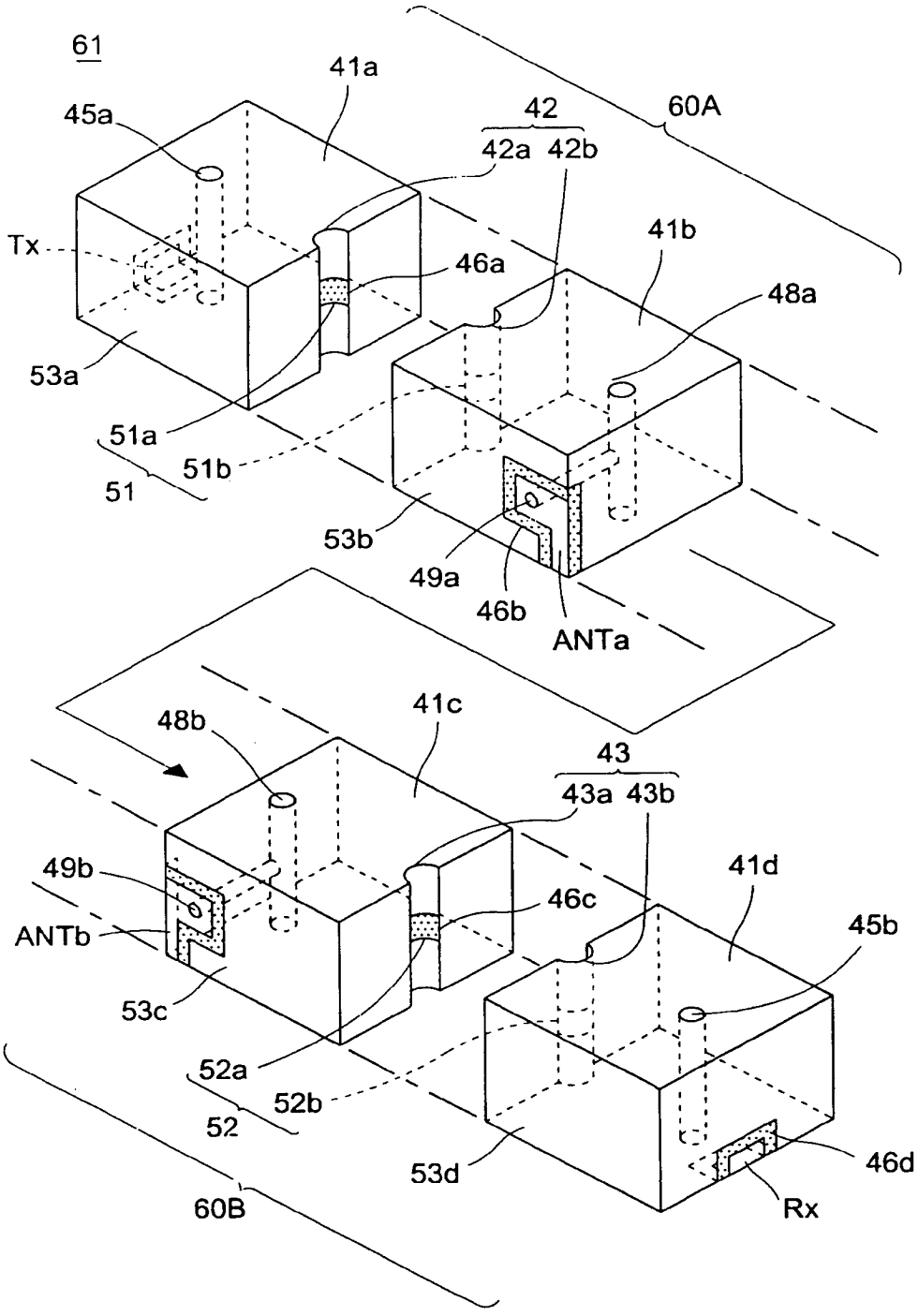

FIG.9

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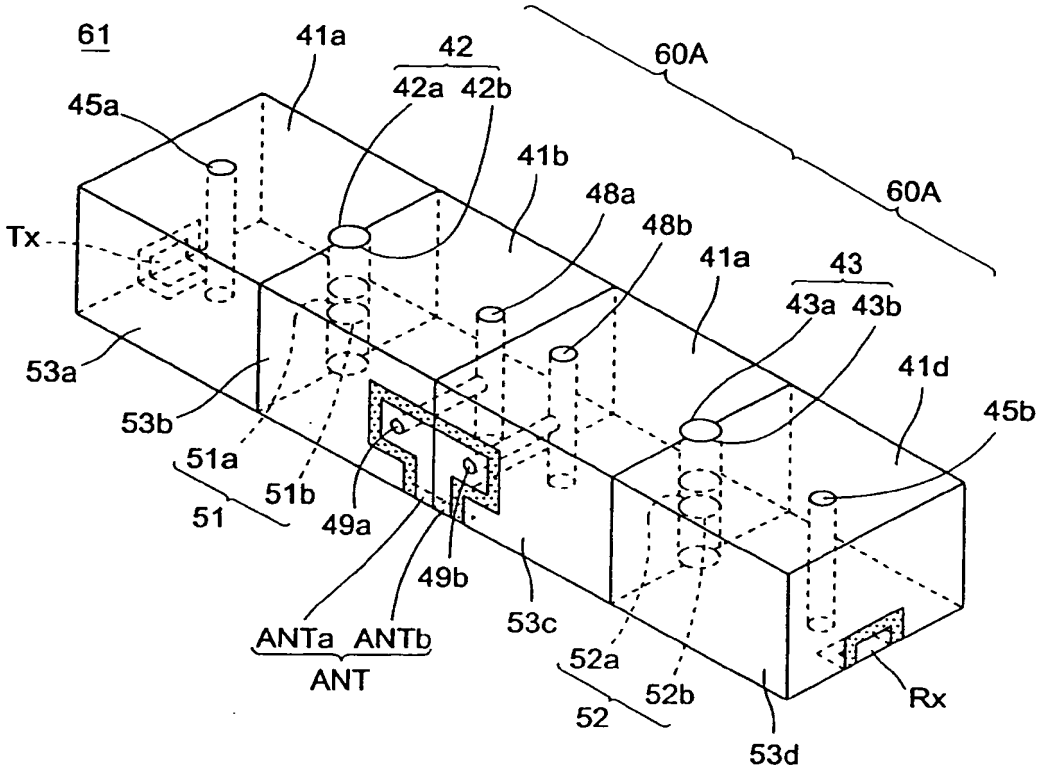

FIG.10

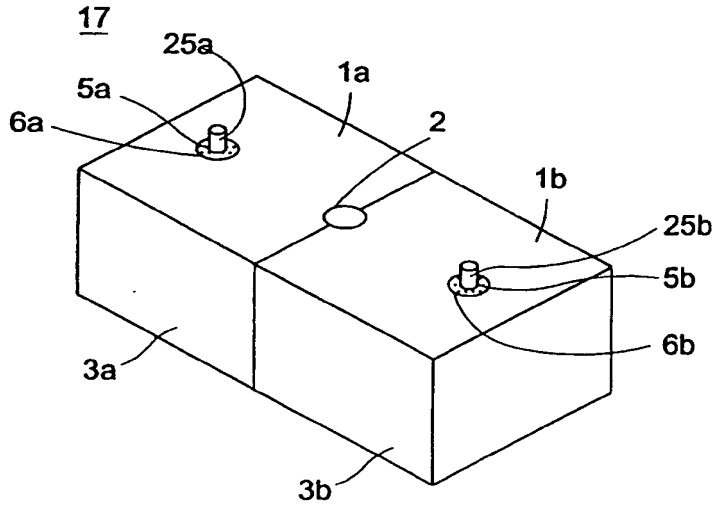

FIG.11

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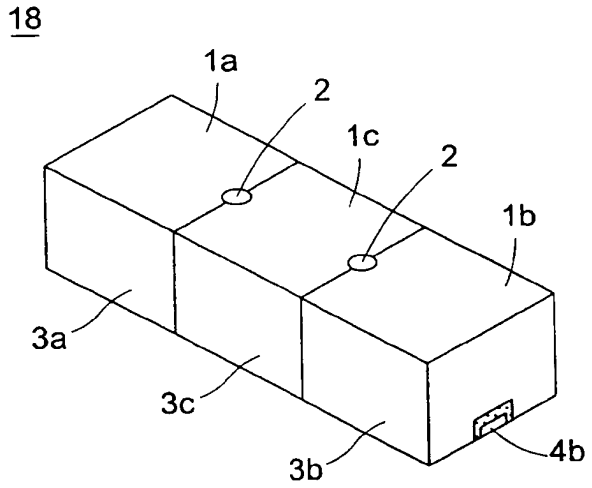

FIG.12

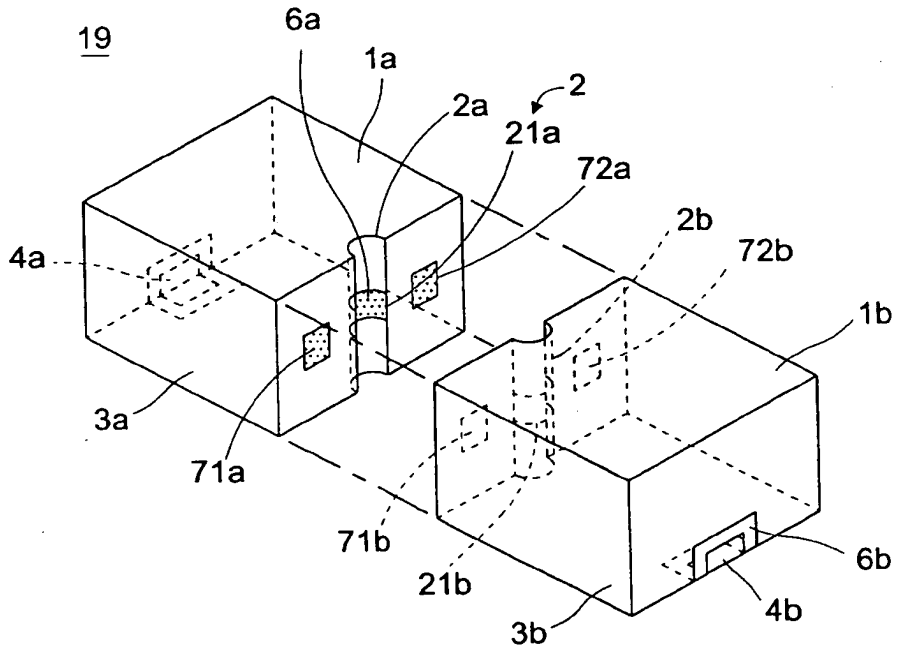

FIG.13

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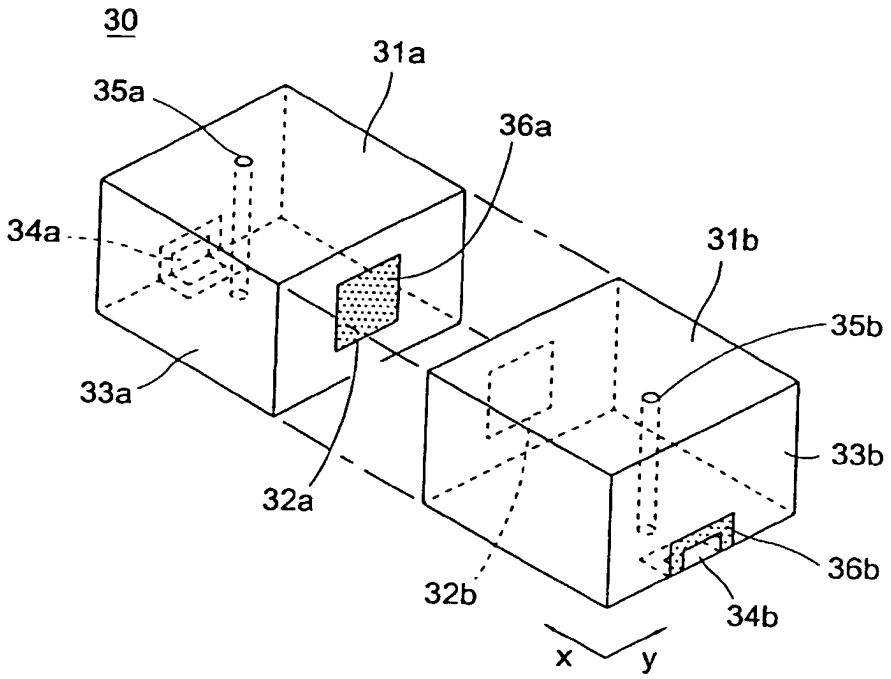

FIG.14

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(71) Applicant:
MURATA MANUFACTURING CO., LTD.
Nagaokakyo-shi Kyoto-fu (JP)

(72) Inventor: **Arakawa, Shigeji**
Nagaokakyo-shi, Kyoto-fu (JP)

(74) Representative:
Schoppe, Fritz, Dipl.-Ing. et al
Schoppe, Zimmermann & Stöckeler
Patentanwälte
Postfach 71 08 67
81458 München (DE)

(54) Dielectric filter and dielectric duplexer

(57) A dielectric filter (11) includes a couple of transverse electric (TE)10-mode resonators (1a, 1b) connected in series. Each resonator (1a, 1b) is such that a conductor (3a, 3b) is formed on one substantially entire surface of a dielectric body (6a, 6b). On the connection surfaces of the resonators (1a, 1b) are formed grooves (2a, 2b), respectively. On the inner round surface of the grooves (2a, 2b), excluding the portions of central gaps (21a, 21b), there are formed conductors (3a, 3b). Connecting the couple of resonators (1a, 1b) combines the grooves (2a, 2b) to form a coupling-adjustment hole (2) having an axis parallel to the interface between the resonators (1a, 1b). The gaps (21a, 21b) combine to form a coupling window (21). The coupling window (21) is exposed in the coupling-adjustment hole (2), which electromagnetically couples the couple of resonators (1a, 1b).

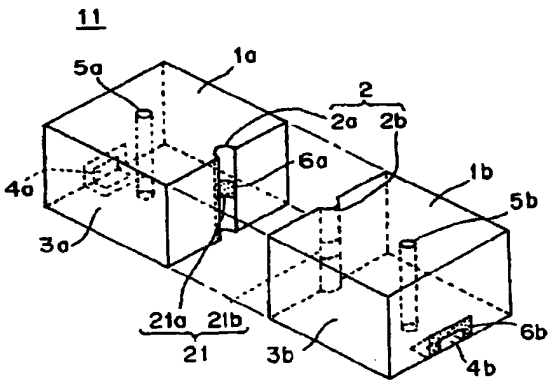

FIG. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 1092

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 4 725 798 A (IGARASHI SADAO) 16 February 1988 (1988-02-16) * column 5, line 56 - column 8, line 29; figures 1-6 *	1-3	H01P1/208
A	US 4 607 242 A (COZZIE JAMES C) 19 August 1986 (1986-08-19) * column 5, line 31 - line 52; figures 4,5 *	1-3	
A	US 4 837 535 A (KONISHI YOSHIHIRO ET AL) 6 June 1989 (1989-06-06) * column 3, line 61 - column 4, line 20; figures 4,5 *	1-3	
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			H01P

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	3 May 2000	La Casta Muñoa, S

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